

SERN NEWS

Volume 37 Issue 3
Arid Lands Restoration



Restoring Arid Lands: A Global Perspective

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A LETTER FROM THE EXECUTIVE DIRECTOR



Bethanie Walder
Executive Director
bethanie@ser.org

It's hard to believe that SER2023, both its in-person and virtual components, has come to an end! After so much planning and preparation, witnessing and being part of the culmination of all these efforts is truly remarkable. The theme, Nature and People as One: Celebrating and Restoring Connection, inspired all aspects of the conference, from the incredible welcome ceremony through to the closing, in the field trips, workshops, keynote speakers, and side events. The technical program was excellent and extensive, covering nearly every aspect of ecological restoration. The responses we've received from delegates have so far been overwhelmingly positive! While we know we can always do better, and we look forward to your constructive feedback, we were thrilled with how everything played out, and we were energized by the knowledge-sharing, goodwill, and personal connections that we created and renewed while meeting both in person and virtually. Most importantly, this conference would not have been possible without many dozens of incredibly dedicated volunteers and without all of our generous sponsors. For a detailed summary, please check out the article on page 19.

Both before and after attending a conference, I had the chance to explore the Australian outback, which was a fantastic opportunity to visit some arid and semi-arid ecosystems (according to the Australian Department of Climate Change, Energy, the Environment, and Water, 70% of Australia is arid or semi-arid). These extraordinary ecosystems raise particular challenges, as water is a significant limiting factor in human efforts to implement ecological restoration. While either too much or too little water can affect restoration efforts, arid and semi-arid land restoration requires a lot of creativity and innovation. Our field trips to Australian restoration sites revealed the importance of fire management. While many plants in these ecosystems are adapted to fire, they struggle with frequent fires caused by invasive grasses and grass control efforts. Interestingly, one method to control invasive guinea grass, as we learned from an Indigenous ranger group, was to cease burning. This approach, although not universally applicable, was effective in their context and highlighted the need for humility and adaptability in all kinds of ecological restoration, not just in arid and semi-arid lands.

This issue's featured articles focus on three key topics in arid land restoration. First, we delve into Kuwait's two-decade journey in restoring lands affected by the 1990 invasion, including research insights and the UN's role in mitigating the impact of oil well fires set during the conflict. Next, we shift to Spain, examining how restoration techniques used in agricultural lands are being applied to enhance ecosystems around solar farms based on recent research findings. Lastly, we discuss an initiative aimed at consolidating and evaluating open-source data to bolster knowledge and formulate data-driven strategies for arid land restoration.

We hope you appreciate this issue of SERNews, and we encourage you to check out all of the updates from SER, especially the conference summary, the announcements about SER's 2023 award winners, and other society news and updates. Wishing all SER members a happy holiday season and a wonderful and restorative new year in 2024!

ARID LANDS RESTORATION

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COVER

Photo by Manon Berney



MEGA RESTORATION AND REMEDIATION PROJECTS IN THE ARID LANDS OF KUWAIT

Samira Omar Asem - Kuwait Institute for Scientific Research (KISR)

Kuwait is an arid land located in the northeastern region of the Arabian Peninsula with a surface area of 17,818 km². The temperature during summer exceeds 50°C, and in winter drops below 10°C. The average annual precipitation is about 120mm. Hot, northwesterly winds prevail during summer in June-July. The terrestrial ecosystems are characterized by a slightly undulating desert plain, ridges and wadis, dunes, and salt marshes.

These desert ecosystems attract a variety of migratory birds and wildlife species, including the Steppe Eagle (*Aquila nipalensis*), the Egyptian spiny-tailed lizard (*Uromastix aegyptius*), and the red fox (*Vulpes vulpes*). Vegetation varies in each ecosystem, dominating plant communities such as *Rhanterium epapposum* and *Haloxylon salicornicum*, *Cyperus conglomeratus*, *Panicum turgidum*, and halophytic species (Omar *et al.* 2007). At the Kuwait Institute for Scientific Research (KISR), a robust program for ecological restoration was firmly established. This initiative involved thorough exploration of promising native plant species such as *Calligonum commosum*, *Rhanterium epapposum*, *Farsetia aegyptia*, *Panicum turgidum* and *Pennisetum divisium*, nurtured within nurseries. Subsequently, it was reintroduced into degraded areas damaged by military activities, polluted from oil pollution, and subjected to soil remediation. Remarkably, the restoration efforts have demonstrated the potential to cultivate certain species at a farm level, enabling large-scale replication within the arid desert environment. This approach gained support from the United Nations Compensation Commission (UNCC), which recognizes the need to mitigate the environmental impact of military activities and oil pollution due to the Iraqi invasion of Kuwait in 1990-91. An environmental remediation program (KERP) was granted to the government to facilitate the rehabilitation of damaged ecosystems, ensuring they regain their original ecological functionality as they existed prior to wartime disruptions.

In a groundbreaking environmental undertaking, the UNCC allocated over \$2.9 billion to the State of Kuwait, marking one of the world's largest environmental remediation and restoration programs (UNCC, 2005). This substantial fund was designated for the KERP, a collaborative effort between the Kuwait National Focal Point (KNFP) and UNCC. KNFP is a nationally established



Image 1. The oil fires in Kuwait in 1990-1991.

authority for supervising the implementation of UNCC decisions and for liaising with UNCC. The KERP initiative was a significant undertaking, addressing severe environmental degradation in Kuwait's soil, groundwater, and sea. It involved numerous stakeholders, including the Kuwait Oil Company (KOC), the Public Authority for Agriculture and Fish Resources (PAAFR), and the Ministry of Electricity and Water (MEW). The urgency arose from the aftermath of the devastating oil fires of 1990-1991 when approximately eight hundred oil wells (Image 1) were deliberately ignited by the Iraqi army before Kuwait's liberation on February 26, 1991. These fires released vast quantities of oil onto the land, filled lowlands, and formed depressions known as "Oil Lakes" (Image 2). The damaged area extended over 114 km² (0.64% of the total land area), with 26 million m³ of soil contaminated by more than 40% of Total Petroleum Hydrocarbons (TPH) that required remediation (Al-Mumin and Al-Baroud, 2019).

Military movement in the desert followed by laying mine built, developing ground fortifications, and spread of ammunitions, bunkers, foxholes, and oil trenches in the desert by the Iraqi forces caused soil crusting, soil compaction, wind erosion of topsoil, hydrological disruption, and loss of biodiversity in the areas (Misak and Omar 2004, 2002, Omar *et al.* 2005, Misak and Omar 2008).

The KISR was the lead organization in successfully executing the KERP. KISR carefully crafted project plans

EXECUTION OF THE REMEDIATION PROGRAM

and phased implementation schedules, including selecting and demonstrating environmentally friendly remediation technologies. The responsible stakeholders initiated this challenging undertaking per UNCC Decision 258 (Image 3). The KERP is a remarkable milestone in Kuwait's history and a reflection of international cooperation in addressing complex environmental challenges. It serves as a beacon of hope for the remediation and restoration of ecosystems affected by similar catastrophic events worldwide.



Image 2. Formation of Oil Lakes after extinguishing the oil fires in 1991.



Image 3. UNCC observations on the extent of damage in the soil contaminated sites at KOC.



Image 4. UXO survey in oil-contaminated areas in Kuwait.

To restore areas damaged by oil pollution, it was necessary first to remediate the soil and remove hydrocarbon pollutants. However, the remediation program faced a formidable challenge in clearing unexploded ordnance (UXO) from the contaminated areas, including the difficult terrain of wet oil lakes. To tackle this daunting task, a comprehensive UXO survey (Image 4) was conducted with the assistance of military experts. This meticulous effort resulted in the discovery and safe disposal of approximately 517 UXO items, along with 34,830 small arms ammunition and pyrotechnics, all disposed of under the oversight of KERP (KOC 2023).

Subsequently, a remediation plan was developed by the Kuwait Oil Company (KOC) in collaboration with an international Project Management Consultant (PMC). The plan considered KOC's ongoing operations in the oil fields. A staggering 2.3 million m³ of heavily contaminated soil were carefully excavated and transported to specially designed landfills. Two strategically located landfills were constructed near the oil fields, with capacities of 1.7 million m³ in the north and 0.6 million m³ in the southeast (Image 5). These landfills adhered to rigorous environmental standards and regulations, with the primary goal of removing contaminated soil, saturated with crude oil, from the naturally recharging aquifer areas in the north and priority areas of KOC in the south. Rigorous groundwater monitoring was conducted near the landfill sites to ensure no seepage of oil contaminants into the groundwater cells over time. However, KOC's commitment to clearing the desert of oil contamination extended beyond landfills. KOC initiated a comprehensive Total Remediation Strategy (TRS) to identify alternative solutions to landfills. This strategy embraced more sustainable environmental approaches, diverse treatment options, the possibility of recovery and re-use, and the application of a Risk-Based Approach (RBA) to most of the contaminated soil. As a result, the original count of seventeen landfills was reduced by KOC. After extensive research conducted by KOC and subsequent approval from the Kuwait Environment Protection Authority (KEPA), a soil remediation standard, known as the Remediation Target Criterion (RTC), was set to 1% Total Petroleum Hydrocarbons (TPH) (Al-Qallaf et al., 2019).

KOC employed bioremediation techniques to treat less contaminated soils and strived to achieve the 1% TPH remediation goal. Bioremediation, a proven and cost-

EXECUTION OF THE RESTORATION PROGRAM

Kuwait's vegetation boasts a diverse ecosystem of 256 annual species and 83 herbaceous perennials that thrive during the milder seasons. Among these, the dominant plant communities include *Haloxylon salicornicum* and *Rhanterium epapposum*. Halophytic species include *Nitraria retusa*, *Tamarix aphylla* and *Zygophyllum qatarense* (Omar et al., 2007).

The ecological restoration program was initiated in 2018 by PAAFR and in 2023 by KOC. Revegetation projects were implemented from remediated areas in both the northern and southern oil fields. UNCC recommended applying modern remediation and revegetation techniques to expedite the recovery of native vegetation and restore the ecological balance of oil-affected areas to pre-invasion levels. In addition to these efforts, KOC established eleven oases immediately after Kuwait's liberation (Image 6). However, these oases were established by KOC independently and were not part of the KERP projects. These intensive revegetation programs introduced drought-tolerant exotic species like *Acacia tortilis*, *Lawsonia inermis*, *Prosopis sp.* and date palms, which proved successful in other greenery projects and landscaping in Kuwait. In my opinion, the reason for introducing exotic species was to use the oases for showcasing remediation efforts and to be used as meeting areas with visitors as well as improving the microclimate of the damaged areas to attract migratory birds and wildlife species to land and reproduce. Following soil remediation, KOC initiated plans for a large-scale revegetation program covering approximately twenty-four km². This ambitious project aimed to reintroduce native plant species, including *Rhanterium epapposum*, *Farsetia aegyptia*, *Calligonum commosum*, *Haloxylon salicornicum*, *Cyperus conglomeratus*, *Lycium shawii*, *Panicum turgidum*, and others.

Under the guidance of PAAFR, large-scale ecological restoration efforts extended to newly designated enclosure areas. Initially, these enclosures covered a total area of 1,679 km² (Figure 1). However, due to land reallocations, this area was marginally reduced. Within these enclosure areas, specific sites were designated for revegetation projects. PAAFR introduced an innovative irrigation technique by constructing water boxes (Image 7). These water boxes were periodically filled with fresh water to facilitate the establishment of seedlings during their crucial first year of plantation. To ensure the success

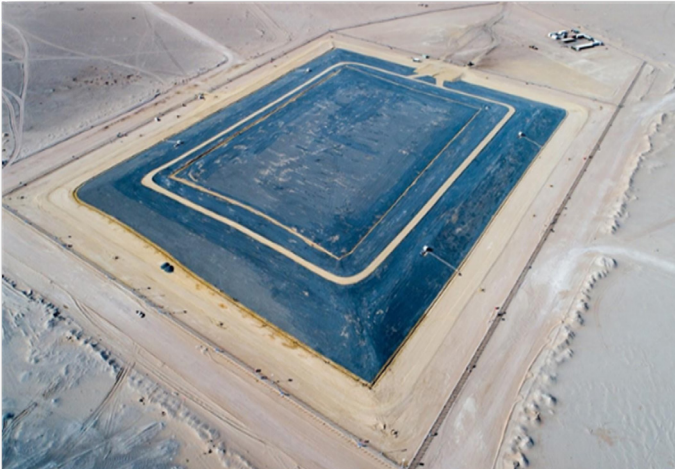


Image 5. Landfill in the Southeast of Kuwait for remediation of contaminated soil.



Image 6. Intensive greenery with exotic species in the KOC Oases.

effective approach that uses local strains of bacteria to consume and break down pollutants to clean up a polluted site played a pivotal role in the process. KOC undertook multiple demonstration projects in collaboration with both local and international companies. These innovative technologies were instrumental in remediating the remaining contaminated soils, making vast land areas suitable for implementing the largest restoration program. The successful outcomes of the remediation efforts resulted in the clearance of thousands of square meters of land, subsequently handed back to KOC for their routine operations.

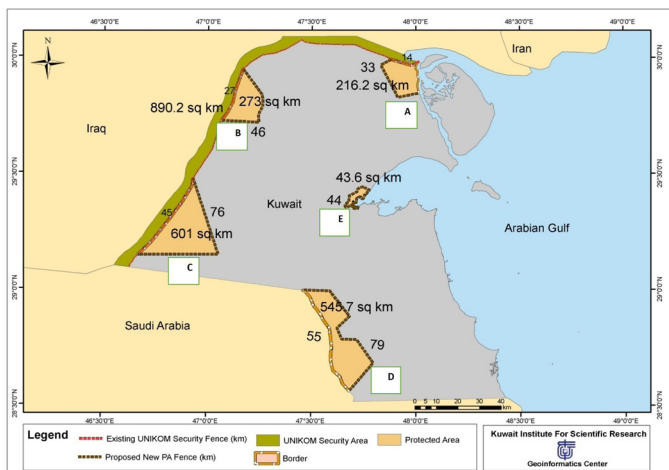


Figure 1. closure areas for ecological restoration

of the projects, contractors were responsible for promptly replacing any lost or damaged plants. Although the use of these water boxes was approved by PAAFR, it is to our knowledge that native plants require minimal watering during the initial stage of establishment with a drip system that proved successful by a pilot study conducted by KISR in 2008 (Bhat, 2020). Drip systems were also tested successfully on farms (Image 8).

In a noteworthy collaboration, several local farmers contributed to the large-scale implementation of the revegetation project by selling native plant species. This approach had previously proven successful through KISR's partnership with local farmers.

KISR took the lead in initiating ecological monitoring of revegetated areas under the jurisdiction of both PAAFR and KOC. KISR created standardized monitoring methods to assess these restored zones' vegetation, wildlife, and overall ecological health (Al-Enezi *et al.* 2022). A study conducted by KISR in 2008 provided practical recommendations for monitoring restoration effectiveness (Brown and Thomas 2008). The study monitored survival rates of plants without irrigation and concluded that survival rates can only be properly monitored in a year of at least average rainfall.

LESSONS LEARNED

The environmental consequences of war on Kuwait's desert ecosystems have been extensive and require the involvement of several stakeholders with proper planning and cost-effective remediation and restoration measures. The case of Kuwait is a continuous learning process, and many attempts have been made to resolve environmental challenges, such as the presence of UXO, remediation technologies, and effective restoration procedures. The

projects were carried out by experts from local and international organizations who worked together as one team to implement best practices and find solutions suitable for local conditions. The restoration program provided know-how and innovative ideas that were implemented. However, more testing and research are needed before large-scale implementation. The involvement of research institutions such as KISR is necessary to evaluate methods prior to large-scale implementation.

Native plants are important sources for large-scale revegetation. Soil amendments from oil pollution are necessary before revegetation with native plants. The involvement of the farmers in the production of native plants for the large-scale revegetation project was a good decision for meeting the project requirements, community involvement, and income generation.

Irrigation is required to support seedling establishment in the initial plantation. Drip irrigation methods have proven successful for large-scale plantations. However, a new innovative approach using water boxes was implemented. Until now, the effective use of these water boxes on native plants and their impact on wildlife in revegetated areas have not been clear. Monitoring these methods' performance and effectiveness on the restoration projects needs to be tested on long-term bases.

The Kuwait Environmental Remediation program stands as a unique and invaluable initiative in the region. It serves as a model for ecological restoration and provides a learning opportunity and a rewarding experience for experts from both local and international organizations and institutions.

SUMMARY

This pioneering environmental issue highlights a remarkable effort led by the UNCC. Over \$2.9 billion was allocated to the KERP to address extensive environmental degradation caused by the deliberate ignition of oil wells during the 1990-1991 Gulf War, marking one of the world's largest environmental restoration initiatives. This collaboration between KNFP and UNCC, involved various stakeholders, including the KOC, PAAFR and the MEW. KERP, spearheaded by the KISR, confronted severe environmental degradation arising from the deliberate ignition of oil wells. This challenge was compounded by the presence of UXO within contaminated areas, necessitating meticulous surveys and safe disposal. Execution of the program involved the excavation of 2.3 million m³ of heavily contaminated soil, relocated to specially designed landfills, adhering to strict environmental standards. KERP also introduced innovative strategies like

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bioremediation, aiming for a TPH remediation standard. This groundbreaking approach significantly reduced the need for landfills. The restoration phase centered on revitalizing Kuwait's arid desert ecosystem, including native plant species and wildlife. Efforts involved selection of potential native plants for revegetation, nurturing native plants in nurseries for seedling establishment with minimal losses, and reintroducing them into damaged areas, aided by irrigation techniques and local farmer collaboration. An active monitoring program followed the revegetation to evaluate survival rate and the ecological functioning of the restored ecosystems. Overall, this initiative is a paradigm of international collaboration in mitigating complex environmental crises, with far-reaching implications for ecosystems worldwide impacted by similar catastrophic events. By seamlessly integrating science, technology, and ecological restoration, KERP not only renews hope but also stands as a testament to humanity's capacity to heal and rejuvenate our natural world.



Image 7. Native plants seedlings establishment by using water boxes for ecological restoration projects.



Image 8. Farm plantation of Panicum turgidum with drip irrigation system

All images provided by the Kuwait Institute for Scientific Research.

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CHALLENGES FOR ECOLOGICAL RESTORATION IN PHOTOVOLTAIC PARKS: A CASE STUDY FROM SPAIN'S EBRO DEPRESSION

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In recent decades, the dedicated surface area for renewable energy has grown significantly in several European countries. Notably, Spain ranks third in electricity production from photovoltaic solar energy. Harmonizing this development with biodiversity, ecosystem services, and agricultural practices poses a substantial challenge for ecology and society. From an ecological perspective, it is imperative to conduct research on the functioning of these emerging ecosystems to lay the foundations for their effective management.

Our Project

In 2022, we initiated a collaborative project with the oil and gas company GALP, which is now shifting to renewable energy production. The project is developing in a photovoltaic park (PVP) located in the Ebro Depression, a semi-arid region of inland Spain. The park consists of 30 photovoltaic power plants that occupy a total of 3000 hectares.”

This project encompasses two key components:

1. Research Project: This segment focuses on studying the impact of solar power plants on ecosystems. Our research delves into the effects of photovoltaic park construction and operation on plants, fauna, and soil, including factors like soil water content, temperature, and biological activity.

2. Pilot Actions: In this part of the project, we implement three pilot actions. These include a grazing plan with the establishment of pastures, the cultivation of aromatic plants, and a restoration plan. The latter involves the application of techniques commonly used in agricultural land naturalization, such as the construction of hedges, forest islands, and nesting boxes, with the goal of enhancing habitat conditions for birds and pollinators and using native species. Our results will be compared with those of areas with spontaneous vegetation and those agricultural fields abandoned at the same data when the powerplants were built. Monitoring these actions will enable us to assess their impact on soil processes, fauna (birds and arthropods), and vegetation (plant cover

and species diversity). Additionally, we will evaluate the provision of ecosystem services. The overarching goal is to understand how ecosystems recover after disturbances caused by PVP installation and to explore the potential of restoration ecology to mitigate these impacts. Because the power plants have been recently constructed all these monitoring actions will act as a baseline to study the evolution of the PVP along time.

After a year's work, we wish to share three key insights with the restoration community:

1. Capability to Restore PVPs:

In arid and semi-arid regions with low and erratic rainfall, as well as other stressors such as limited soil nutrient availability, ecosystems are highly vulnerable to land degradation and challenging to restore. However, these ecosystems exhibit resilience, and eliminating factors impeding natural regeneration often leads to recovery. Based on our current knowledge, the limiting factors in PVPs include changes at the landscape level that hinder habitat use by fauna and their movements across the landscape, altered soil properties hindering plant establishment, altered microclimates due to the shade created by the panels, and the conversion of communities to ruderal states. Remarkably, some of these limiting factors resemble those encountered when restoring agricultural lands. By integrating the agricultural land restoration framework with techniques developed for dryland restoration, such as species selection, plant production, innovative implantation methods, and the utilization of biological interactions to enhance restoration outcomes, we have a suite of tools well-suited for the restoration of PVPs in drylands.

2. Limitations of PVPs Restoration:

Adhering to the Restorative Continuum concept (Gann *et al.* 2019), which offers a spectrum of activities and interventions to improve the environment and reverse degradation, we recognize several constraints that hinder full ecosystem recovery in PVPs. These include the need to



Research efforts at photovoltaic park located in the Ebro Depression.
 Images provided by Juame Tormo.

maintain short vegetation close to the panels, preventing some areas from progressing beyond grasslands or early successional stages. Additionally, certain species may not survive within PVPs, as their habitats cannot be fully reconstructed, and the landscape changes may render the area unsuitable for some species. It is important to acknowledge that PVPs can represent a novel ecosystem, and attempts to restore them should carefully consider and develop an appropriate and viable goal.

3. Evaluating PVP Restoration:

We recommend using Before-After-Control-Impact (BACI) designs when assessing the environmental impacts of renewable energy projects. This approach facilitates a better understanding of these effects. When evaluating restoration actions, consider the use of tools such as the Five-Star System and the Ecological Recovery Wheel (Gann *et al.* 2019). It's essential to critically assess the selection of reference or control systems, as these choices significantly influence the results, e.g. most PVPs in Spain are built in agricultural rainfed marginal lands that house very low diversity. The disturbance created by the PVP might produce an increase in diversity compared to the prior agricultural ecosystem. However, this perceived increase often stems from the proliferation of weed species commonly found in abandoned fields or vacant urban or industrial plots. Such a scenario may misleadingly suggest that PVPs enhance the ecological value of lands. The ecological recovery wheel can be used to design a restoration project that will focus on the appropriate native species recovery needed to achieve the target, as determined by the reference model. During the monitoring phase you can then assess whether weedy species are declining and native species are recovering, and this can be illustrated by completing a post-project recovery wheel as well. Regardless of whether or not you use the wheels, the restoration plan and associated monitoring should be considering the species composition (including both native and invasive species) of local communities in mature stages to prevent misinterpretation of biodiversity indices.

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THE GLOBAL ARID ZONE PROJECT & GLOBAL RESTORE PROJECT: META-SCIENCE IN A CHANGING WORLD

Emma Ladouceur and Nancy Shackelford -The Global Arid Zone Project & Global Restore Project

Restoration outcomes can be highly variable, particularly in dryland systems. Understanding what drives that variability is important to designing restoration with the highest chance of success. Historically, individual project data has been used for adaptive management of local sites, organisational learning about successful restoration design, and/or shared knowledge in local practice networks. Harmonizing data from a diversity of restoration studies and conducting data synthesis and meta-analyses can help us understand broad patterns and global trends and allow the information to be reapplied back at the local level to improve results on existing and new projects.

The Global Arid Zone Project (GAZP) at the University of Colorado collected and harmonized data from projects across the world to start assessing these global trends. For example, one outstanding result was that seeding rates are a pivotal success factor; but the success varies depending on how arid the site is. Specifically, arid sites required more seed for minimal success, while semi-arid sites had a seeding saturation point (Shackelford et al. 2021). The GAZP then joined forces with the Biodiversity Synthesis group at iDiv, in Germany to initiate the [Global Restore Project](#), merging dryland data with data across the global precipitation gradient to assess seeding/planting within diverse management strategies (Ladouceur and Shackelford 2020). The main goal of this partnership is knowledge-sharing to support success in the UN Decade on Ecosystem Restoration.

Now, The Global Restore Project is collecting species-level vegetation community monitoring data from existing terrestrial ecological restoration projects across a wide aridity /precipitation gradient that have used seeding or planting as an active restoration treatment (Figure 1), often nested within other management approaches. We harmonize these raw data from many projects together in a shared structure so they can be analysed together (Ladouceur and Shackelford 2020). By focusing on fine-grain, species-level information the most granular on-site data available, we enhance the flexibility in the usability of these data for other purposes and ask further questions. We expect to make this compilation of data open access

for the whole research and restoration community soon. We are pleased to share a few examples of what we've learned through this young collaboration. These efforts represent a powerful suite of developing tools to increase our capacity for effective, efficient, engaged restoration.

SETTING REALISTIC GOALS IN ARID LANDS RESTORATION

By collecting data across a wide precipitation gradient in North America, ranging from xeric to mesic systems, we learned how restoration dynamics become more or less predictable depending on the location along the aridity gradient (Bertuol-Garcia et al. 2023). While we could predict when exotic species would dominate (especially in xeric sites), predicting the presence and specificity of rare species proved more challenging. Thus, this can help develop more realistic restoration goals across both ends of the aridity spectrum.

OLD FIELD RECOVERY

Within oak prairie savannas at Cedar Creek Ecosystem Science Reserve, we studied a meta-community of old fields recovering from post-agricultural disturbance and abandonment. Our findings indicate that, even after 80 to 100 years, sites typically do not achieve full recovery across different scales on their own without intervention (Isbell et al. 2019, Ladouceur et al. 2023). For example, through this synthesis, we identified evidence-based recommendations to help achieve full recovery. We identified which species had not recovered in order to make species recommendations for future active seeding. Further, we identified profound competition from exotic grasses, indicating a need for invasive control and management. Additionally, returning traditional disturbance regimes such as bison grazing and fire might also enhance recovery. The resurveys conducted at Cedar Creek may serve as a helpful blueprint for initiating analogous long-term resurvey programs in other restoration sites that have not yet achieved the expected results.

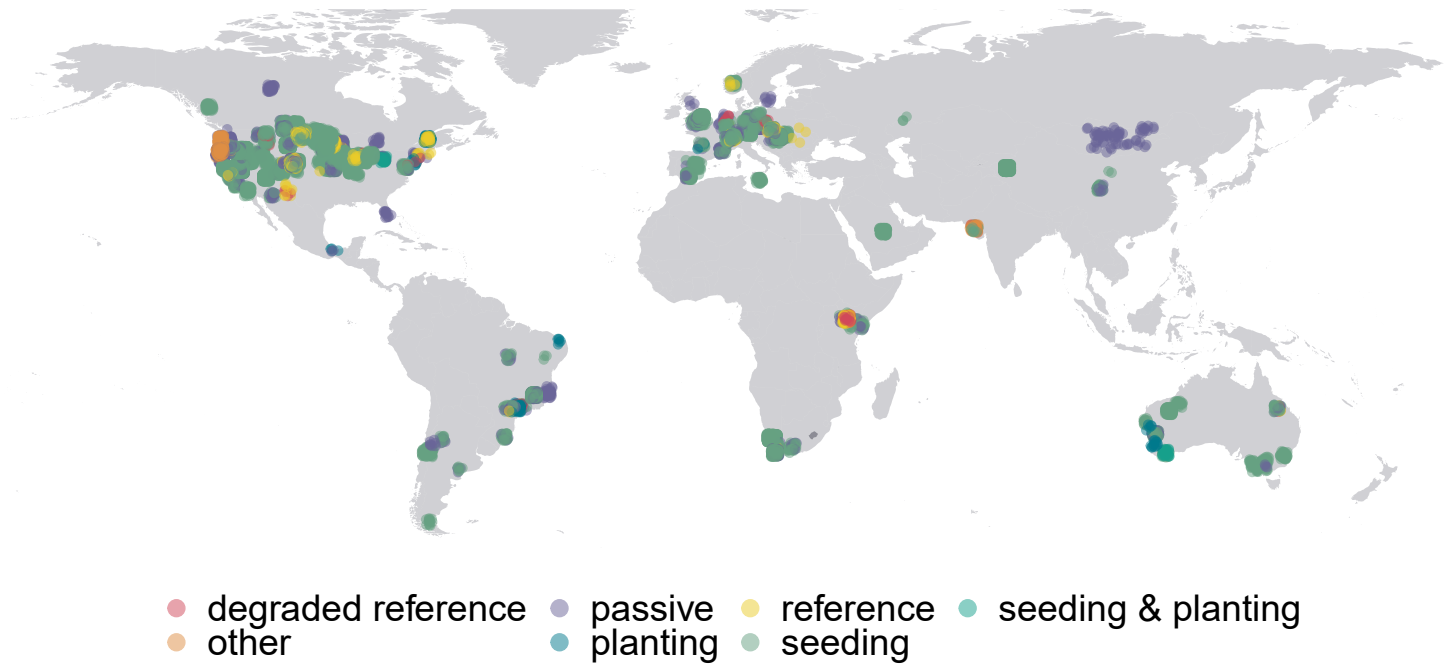


Figure 1. GAZP and GRP monitoring data map.

NEXT STEPS

The Global Restore Project is one part of a landscape of global efforts exploring a birds-eye view of ecological restoration. We have several syntheses of these restoration data in the works that we hope will help understand natural regeneration and assisted restoration practices. In spring-summer 2024, the Global Restore Project is partnering with Dr. Will Glenny and Dr. Tiffany Knight's [Spatial Interaction Ecology group](#) to survey plant-pollinator networks in restored and unrestored sites across Europe's aridity gradient. [Reach out to us](#) if you want to recommend a site to include in this study.

Contributing vegetation monitoring data to an effort like this does not inhibit any plans for using the data individually for local scale understanding, and contributing data to projects like this is [easy and straightforward](#). Together, we can take disparate pieces of information from individual projects and bring them all to gain a bird's eye view of our shared and unique practices and outcomes. Pursuing this across arid and non-arid lands concomitantly allows us to understand shared and unique dynamics with benchmarks against the full spectrum of where we practice restoration.

SUMMARY

The UN Decade on Ecosystem Restoration (2021-2030) is inspiring more restoration work to be done than ever before. Together, we can look forward to this decade and beyond by looking back at what's already been done through data synthesis. We can better inform what's working and what is not across aridity gradients and enhance practice via evidence-based outcomes. We encourage anyone with vegetation community monitoring data from restoration projects around the world, across arid and non-arid zones, to reach out to the Global Restore Project to contribute your open access data for shared learning. We thank all the people who have already published data open access and participated in this long-term learning effort by sharing their restoration project monitoring data with us, and we look forward to engaging with new collaborators to further support efforts to improve restoration effectiveness, engagement, and efficiency.

ACKNOWLEDGEMENTS

We gratefully acknowledge the support of the German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig, funded by the German Research Foundation (DFG–FZT 118, 202548816). The Global Restore Project has received support from The Biodiversity Synthesis group and the Synthesis Centre (sDiv) at iDiv, as well as from the University of Victoria, on beautiful Vancouver Island, Canada, and the Alexander von Humboldt Foundation.

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FEATURED RESOURCES

UPDATES FROM THE RESTORATION RESOURCE CENTER, RESTORATION ECOLOGY, AND THE WEBINAR LIBRARY

Restoration Resource Center

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SER's [Restoration Resource Center](#)(RRC) is an online platform for exchanging knowledge and experience through ecological restoration projects, publications, and other resources from around the world. Practitioners and researchers are encouraged to submit their projects.

Restoration Ecology Editor-in-Chief Picks

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This quarter, we're featuring four articles from the recent issue of [Restoration Ecology](#) selected by our Editor-in-Chief, Stephen Murphy. See Stephen's selections below.

Webinar Library

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Enjoying the theme of this issue? If you'd like to learn more about arid lands restoration, check out the selected webinars below from SER's [Webinar Library](#).



RESTORATION RESOURCE CENTER FEATURED RESOURCES

RESTORATION ECOLOGY- ARID LANDS THEMATIC SERIES

The Restoration Ecology - Arid Lands (RE-AL) thematic series is a collaboration between the Society for Ecological Restoration (SER) and the Kuwait Institute for Scientific Research (KISR). Since 2020, we have published seven issues of RE-AL (two issues per year since 2021), collating and elevating arid and semi-arid land research from around the world. The thematic series seeks to deepen understanding and improve practices in ecological restoration across arid and semi-arid regions worldwide, with the goal of mitigating biodiversity and ecosystem loss, combating poverty, strengthening social capital, and building resilient socio-ecological systems that are free from the threats of land degradation and desertification. We encourage you to explore past issues to learn more about recent arid lands research.



photo by Wirestock

A Guide for Desert and Dryland Restoration

David A. Bainbridge, 2012

Dryland degradation and desertification, impacting nearly a billion people worldwide, lead to the loss of biological resources and land productivity annually. David Bainbridge's book, 'A Guide for Desert and Dryland Restoration,' draws from his over 25 years of experience in land restoration in the American Southwest, offering practical solutions to combat these issues. The book covers the ecology of desert plants, the causes of desertification, and detailed methods for evaluating, planning, implementing, and monitoring restoration projects, with a focus on cost-effective and practical techniques. Serving as a comprehensive resource, it is essential for restorationists, farmers, ranchers, gardeners, landscapers, outdoor recreation professionals, and environmental activists working in arid regions.



photo by Wirestock

Soil microbial communities are 'first responders' in the restoration of drylands and savannas

This symposium delves into the intricate dynamics of biocrust communities in deserts, semi-arid rangelands, and monsoonal savannas. It focuses on the critical role these communities play in capturing and utilizing rainfall and nutrient resources during brief, opportune periods. Attendees will explore the symbiotic relationships between phototrophic organisms (cyanobacteria, lichens, algae, liverworts, and mosses) and heterotrophs (such as bacteria and fungi). These interactions result in the formation of biocrusts in the upper layers of soil, which are vital for nitrogen and carbon fixation, nutrient cycling, soil stabilization, and enhancing rainfall infiltration. The symposium aims to highlight the biodiversity within these microorganism communities and their significant impact on ecological processes in arid and semi-arid ecosystems.

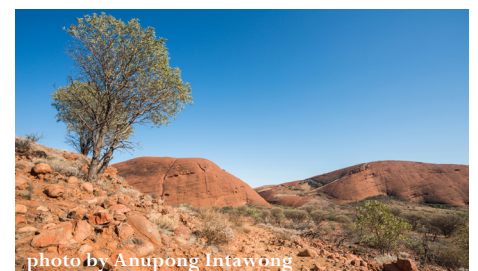


photo by Anupong Intawong



RESTORATION ECOLOGY EDITOR-IN-CHIEF PICKS

[CAN DELAYING GERMINATION REDUCE BARRIERS TO SUCCESSFUL EMERGENCE FOR EARLY-GERMINATING, FALL-SOWN NATIVE BUNCHGRASS SEEDS IN COLD DESERTS?](#)

Owen W. Baughman, Jay D. Kerby, Chad S. Boyd, Matthew D. Madsen, Tony J. Svejcar, 2023

This study evaluates a hydrophobic seed coating as a solution to reduce over-winter mortality in semi-arid wildland restoration in the western U.S. The coating effectively delayed germination of fall-sown seeds, decreasing pre-winter germination by 84% and overall germination by 23%, leading to a 2.1-fold increase in seedling density in some trials. However, the treatment's success varied across different sites and years, suggesting the need for further research to optimize germination strategies and understand winter-related mortality factors in these ecosystems.

[REGENERATIVE CAPACITY OF OLD-FIELDS ON SEMI-ARID FLOODPLAINS IN THE NORTHERN MURRAY-DARLING BASIN](#)

SPeta Zivec, Fran Sheldon, Samantha Capon, 2023

The study explores the potential of natural regeneration in restoring abandoned agricultural lands in semi-arid floodplains of eastern Australia, focusing on the regenerative capacity of seed banks in old fields. It finds that soil seed banks contain the most germinable species, dominated by annual herbaceous species, while animal scats are significant for seed transport, and leaf litter is crucial for woody vegetation regeneration. The similarity in seedling assemblages between old fields and adjacent remnant vegetation indicates a resilient seed bank, contributing mainly to the regeneration of understory and midstory species, with a notable absence of overstory tree species.

[SOCIO-ECOLOGICAL EVIDENCE HIGHLIGHTS THAT NATIVE PROSOPIS SPECIES ARE BETTER FOR ARID LAND RESTORATION THAN NON-NATIVE ONES](#)

Abolfazl Sharifian, Hamid Niknahad-Gharmakher, Mehdi Foadizada, Auob Tabe, Ross T. Shackleton, 2023

The study evaluated the socio-ecological impacts of two *Prosopis* species, the native *Prosopis cineraria*, and the non-native *P. juliflora*, for restoration projects in Southern Iran by analyzing soil properties, vegetation indices, and pastoralist perceptions. The findings revealed that areas with native *P. cineraria* had higher native vegetation cover and diversity, with similar soil properties to those under *P. juliflora*, but the native species was perceived as more beneficial for ecosystem services and livelihoods with lower invasive potential. The study suggests that native *P. cineraria* is a preferable choice for restoration efforts due to its ecological and social advantages and lower risks compared to the non-native *P. juliflora*.

[PLANT RECRUITMENT IN DRYLANDS VARIES BY SITE, YEAR, AND SEEDING TECHNIQUE](#)

Lauren N. Svejcar, Jay D. Kerby, Tony J. Svejcar, Bruce Mackey, Chad S. Boyd, Owen W. Baughman, Matthew D. Madsen, Kirk W. Davies, 2023

The study reveals that in dryland ecosystems, drill seeding generally leads to better establishment of *Pseudoroegneria spicata* (bluebunch wheatgrass) seedlings than broadcast seeding, with 2.7 times greater recruitment after two years. This success varies significantly depending on factors like seeding year, landscape aspect, and soil type, with drill seeding performing notably better on clay soils and flat or north-facing landscapes. The findings emphasize the importance of considering spatial and temporal variations in seeding methods for effective restoration in these ecosystems.



WEBINAR LIBRARY IN CASE YOU MISSED IT...

SER hosts a webinar series to engage with restoration experts from across academia and the applied field; we also partner with our chapters to bring additional regional webinar perspectives. One of the benefits of SER membership is access to our ever-expanding Webinar Library as well as our conference presentation library.



photo by Wirestock

[Fire as a tool to look after the bio-cultural and environmental systems of the desert](#)

Kevin Tromp, Ngurrara Country Manager, 2023.



photo by Freepik

[The gap between mycorrhizal science & application: relevance, research from an arid region, and tips for managers and practitioners during the UN Decade on Ecosystem Restoration](#)

Lisa M. Markovchick, 2023



photo by Dominik

[Communities harnessing natural regeneration in ecological restoration: case studies around the world](#)

Hosted by SER's [Natural Regeneration Network](#), 2023.

Through our Webinar Library, active members of SER can view recordings of 100+ restoration webinars presented by scientists, researchers, practitioners, and policy experts from across the world.

[Access Webinar Library](#)

SOCIETY NEWS

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MEMBERSHIP UPDATES

WELCOME TO NEW BUSINESS MEMBERS

All Business Members are listed in the [Restoration Directory](#) on SER's Restoration Resource Center. The directory provides a resource to identify and locate environmental restoration leaders in private and public industries.



CONSERVATION
INTERNATIONAL

Conservation International Blue has worked to spotlight and secure the critical benefits that nature provides humanity. Combining fieldwork with innovations in science, policy and finance, they help protect more than 6 million square kilometers (2.3 million square miles) of land and sea across more than 70 countries. Building on strong scientific foundations, partnerships, and field demonstrations, Conservation International empowers societies to responsibly and sustainably care for nature, our global biodiversity, and the well-being of humanity. *Conservation International is a proud sponsor of SER2023.* <https://www.conservation.org/>



Endemic
Environmental Services

Endemic Environmental Services is a renowned multidisciplinary environmental consulting firm that serves public and private sector clients. Their team members apply their scientific expertise, experience, initiative, and innovation to natural resource management. Endemic Environmental Services' mission is to provide expert guidance and innovative solutions that empower their clients and sustain biodiversity amidst an evolving society. <https://www.endemicenvironmental.net/>



MAD Scientist Associates provides high-quality wetland and ecological consulting services to clients in the public and private sectors, including threatened and endangered species, critical habitat surveys, full wetland services (delineation, permitting, mitigation & monitoring), stream characterizations, and aquatic studies, botanical surveys, ecological risk assessments, and other specialized ecological services. MAD's niche is to provide their clients with accurate, comprehensive, and timely data on ecological consulting projects big and small. Their ultimate goal is to provide the highest quality information to facilitate sound environmental decisions. <https://madscientistassociates.net/>



Tree Time Services is a consulting company dedicated to improving North American forests through Reclamation, Silviculture and Archaeology services. They are professional foresters, planters, biologists, and archaeologists passionate about helping industry, government, and community clients revegetate disturbed areas and serve as stewards of Alberta's natural heritage. Tree Time's Core Purpose is to steward and shape the landscape for our collective future. <https://treetimeservices.ca/>



SER2023 CONFERENCE UPDATE

SER was thrilled to welcome more than 1200 delegates from over 80 countries around the world to SER2023, the 10th World Conference on Ecological Restoration, including both an in-person component in Darwin, Australia (September) and a virtual component (November). The conference's comprehensive agenda encompassed plenaries, symposia, workshops, oral and poster presentations, yarning (sharing) circles, field trips, trainings, networking sessions, a film festival, and cultural activities. SER also partnered with the International Union for the Conservation of Nature (IUCN) Commission on Ecosystem Management (CEM) Ecosystem Restoration Thematic Group (ERTG) to co-host our fifth Global Forum on ecological restoration. In addition, we were pleased to welcome the UN Decade on Ecosystem Restoration Advisory Board who joined us in Darwin where they launched their second board term, spent a day in the field with the SER Board, and hosted an all-day UN Decade pavilion at SER2023.

Daily Plenaries, Darwin Call to Action, and Awards

In 2022, The daily plenaries at SER2023 were designed to elevate the conference theme: Nature and People as One – Celebrating and Restoring Connection. Given this theme, SER was pleased to be able to feature several

indigenous restoration leaders from around the world as keynote speakers. Other noteworthy outcomes from the plenaries include the signing of the [Darwin Call to Action](#) and SER awards presented to prominent figures and rising stars for exceptional achievements in ecological restoration.

Day 1 Indigenous-Led Restoration: The opening plenary session illuminated the importance of Indigenous-led restoration, featuring Kia Dowell, a Gija woman from Warmun Community in Western Australia and Chair of Gelongyem Limited; and Lucy Molenkei, a Maasai leader from Kenya, Executive Director of Indigenous Information Network, and Advisory Board member for the UN Decade on Ecosystem Restoration. Kia shared both the challenges her community has experienced due to the Argyle Diamond Mine and the work Gelongyem is doing to empower community and engage Traditional Owners in both cultural and ecological rehabilitation of the Argyle Diamond Mine. Lucy, an expert in biodiversity and gender issues, emphasized the role played by Indigenous women at the forefront of the fight to restore their lands.

Day 2 Making the Business Case for Ecological Restoration: Moderated by SER International Policy Lead George Gann, this dynamic high-level plenary panel made a very strong business case for ecological restoration.



The UN Decade on Ecosystem Restoration Advisory Board and SER staff in the field at the Casuarina Coastal Reserve in Australia at SER2023

The panelists – Frank Mars, Mars Corporation; Henri Douche, SCOR; Julia Oliva, Union for Ethical BioTrade; and Indigenous leader Hanie Moghani – discussed how ecological restoration is a critical tool for corporations to help manage food systems, raw materials, and global supply chains that are becoming increasingly vulnerable to climate change and land degradation. Panelists recognized the value of SER’s science-based restoration standards for helping manage risks and ensure long-term availability of the essential natural resources that companies depend on.

Day 3 Community Led Restoration: Sera Gibson shared how the Taranaki Mounga restoration program is empowering and strengthening Maori people by reconnecting them with their history, offering a sense of ownership and belonging, and inspiring them to protect the restored spaces for generations to come. Lalao Aigrette illustrated how an inclusive restoration collaboration of 22 community groups, the Madagascar Ministry of Environment, and the social enterprise Blue Ventures aligns with the SER standards to achieve excellent outcomes. By replanting 14.5 million mangrove trees, the community experienced economic benefits, increased fisheries productivity, and coastal protection.

Day 4 Scaling Up Restoration: The final plenary speakers emphasized mechanisms for delivering restoration at scale. Marina Best, representing her Métis community and serving as the Indigenous Relations Manager for the National Urban Parks and Ecological Corridors programs at Parks Canada, highlighted global impact of implementing local projects following conservation and restoration standards, with an emphasis on global efforts to grow indigenous engagement in restoration. Fangyuan Hua, Conservation Ecologist at Peking University, China, shared the results of a groundbreaking meta-analysis of tree planting efforts and their impact to biodiversity; identifying both challenges and opportunities for implementing such programs at scale.

Signing the Darwin Call to Action: SER, in collaboration with the UN Decade on Ecosystem Restoration Advisory Board and more than 1,000 delegates at SER2023, issued a Call to Action at the closing ceremony of the in-person conference. The Call to Action emphasizes the urgent need to scale up effective, standards-based restoration worldwide as a mechanism to re-establish a healthy, balanced connection between people and nature and challenges governments, corporations, and communities to engage and invest in restoration. [Read the full Call to Action here.](#)



Lucy Mullenkei (Top) and Kia Dowell (Bottom) during their plenary talk at SER2023 in Darwin Australia.

SER2023 Awards Presentations: In Darwin, SER announced the 2023 SER Award recipients, recognizing outstanding achievements in ecological restoration. The Awards program, sponsored by Mars Corporation, featured advancements in environmental microbiology, inclusive Indigenous engagement, innovative communication strategies that enhance public awareness and participation, outstanding publications in Restoration Ecology, and lifetime achievements. Alongside the 2023 SER Award recipients, winners of the first Restoration Film Festival Competition, student presentation award winners, and the recipient of the SER2023 Offsets funds were announced. [Read the full statement here.](#)

Global Forum

SER and the IUCN Commission on Ecosystem Management-Ecosystem Restoration Thematic Group (IUCN-CEM ERTG) partnered to launch our 5th Global Forum on Ecological Restoration at SER2023 in Darwin. The theme of the 5th Forum is “Cultural, social, and ecological approaches for assessing restoration impact”. Approximately 30 invited participants joined us in a working session intended to ultimately develop one or more guidance products related to incorporating social and cultural perspectives into restoration, as well as a restoration impact assessment tool for use by restoration practitioners, community members, policymakers, and other stakeholder. The meeting opened with a short panel discussion to help bring the theme into focus. For the remainder of the day, the participants worked through a series of questions to begin to address the theme.

The one-day session was just the launch of the 5th Forum, and we will be following up with a series of virtual sessions over the next 12 months with the intent to release one or more products at the end of 2024.

Member Engagement

SER celebrated its 35th birthday at the conference. As part of our celebration, we announced that we recently achieved a significant milestone - SER has officially surpassed 5,000 members! Our strong and growing membership reflects the increasing demand for and recognition of SER’s leadership in the restoration field.

SER welcomed its inaugural cohort of 22 Open Doors Travel Grant recipients to the conference. The Open Doors Travel Grant program offers need-based travel support and a registration waiver to delegates worldwide. This grant opportunity is funded by conference sponsorships and was



Lalao Aigrette and Sera Gibson during their plenary talk at SER2023 in Darwin Australia.



Marina Best and Fangyuan Hua during their plenary talk at SER2023 in Darwin Australia.



Left to right, Henri Douche from SCOR, Julia Oliva from UEBT, George Gann from SER, Frank Mars from Mars Inc. and Hanieh Moghani, member of the Advisory Board for the UN Decade on Ecosystem Restoration during the plenary panel discussion at SER2023 in Darwin Australia.

available to SER members through a competitive application process. Open Doors grants removed the cost barrier of attending SER, providing opportunities for learning across different regions, areas of expertise, and cultures.

Members who attended SER2023 told us that, beyond the knowledge sharing, this conference provided them with the opportunity to make immediate and impactful connections and strengthen their sense of community. In addition to the technical programs, SER2023 included interactive programs for students and emerging professionals, arts and culture, and fun. We were also thrilled to be able to host an open conference dinner for all delegates without additional cost, thanks to sponsorship from the Royal Commission from AIUla. The celebration dinner was an incredible success, and we look forward to continuing this tradition at future conferences.

Another memorable night was the screening of the SER2023 Ecological Restoration Film Festival, directed by SER members Jillianne Segura and Aaron Eger from the Darwin Australia Local Organizing Committee. The film competition was open to existing and new films which embodied the principles of ecological restoration and explored the relationship between people, science, restoration, and the environment.

We hosted several events for Emerging Professionals as part of SER2023, including an in-person panel discussion titled “Careers in Ecological Restoration- Finding Your Path in the Field,” and a workshop (as part of the virtual conference sessions in November) exploring the role of emerging scientists in restoration ecology. Between these two sessions we heard candidly about career journeys in restoration, and we shared ideas for how emerging professionals can influence the science and practice of restoration, engage with SER, and build rewarding professional permanent careers in this field. Thanks to SEP Board representative Emanuela Weidlich and all

SEP committee members who helped coordinate these activities.

We would like to extend a special thank you to all the SER2023 conference sponsors who made this conference a success:

Business Events Australia, The Royal Commission for AIUla, Mars Inc., UNCCD20 Global Land Initiative, Heidelberg Materials, The Nature Conservancy, World Resources Institute, World Wildlife Fund, Stantec, Conservation International, Ecosure, and Syrinx.

We would also like to thank the many exhibitors who showcased their information and services to the delegates.



The Darwin Call to Action signed by Bethanie Walder, Executive Director, Society for Ecological Restoration and Gopal D. Patel Co-chair, Advisory Board, UN Decade on Ecosystem Restoration.



A birthday cake in celebration of SER's 35th birthday at SER2023.



2023 SER Award Winners from left to right, Ms. Victoria Stubbs, Dr. Ferran Garcia-Pichel, Dr. Dzaeman Dzulkifli from Tropical Rainforest Conservation Centre, Bakan Jagdish Sudhakar from Gulf of Mannar Biosphere Reserve Trust, Njamasi Chiwanga from the LEAD Foundation, Prof. David Suggett and Ms. Lorna Howlett from the Coral Nature Program, and Dan Cox from Envite Environment.



Conference celebration dinner at SER2023

UNCCD-G20 Restoration of Mine Sites Workshop

Funded by the UNCCD-G20 Global Land Initiative, the Society for Ecological Restoration hosted “Ecological Restoration of Mine Sites: A Hands-On Workshop” in Perth, Australia, from October 2-4, 2023. This workshop focused on advancing sustainable mining practices, enhancing collaborative efforts, setting restoration standards, and engaging local communities, with a special emphasis on involving Indigenous groups. The three-day workshop featured a mix of lectures, discussions, site visits, and practical exercises. These activities centered around the use of tools like the Ecological Recovery and Social Benefits Wheels. The 28 participants from 19 countries represented a broad diversity of geographies and organizations, bringing varied viewpoints and enriching the workshop’s content and outcomes.

The objectives of the workshop were multidisciplinary, emphasizing community engagement, adherence to international standards for post-mining restoration, comprehensive recovery of legacy mines, benchmarking and models, and the importance of native seeds in ecosystem resilience. The scope included both theoretical knowledge and practical exercises, with two days of field trips to operational sites for a hands-on understanding of the challenges and solutions in ecological restoration.

The workshop also emphasized the role of technology and innovation in ecological restoration. Experts demonstrated the use of cutting-edge tools and software for site analysis, monitoring, and management, underlining the potential of technology to enhance restoration efforts. Furthermore, there was a significant focus on policy frameworks and regulatory compliance, with discussions around how legislation and industry standards could be aligned with ecological objectives. These conversations were crucial in highlighting the need for a cohesive approach that integrates environmental, social, and regulatory aspects. The workshop concluded with a consensus on the necessity of ongoing collaboration between industry, academia, and communities, stressing that the success of ecological restoration in mining hinges on these cooperative efforts. The exchange of ideas and best practices at this event set a foundation for future advancements in the field.

The workshop was a valuable step towards integrating ecological restoration principles and practices into mining operations. It highlighted the importance of continuous improvement and adaptability within this field, balancing theory with practical application.



Images from the UNCCD-G20 Restoration of Mine Site Workshop.

Meet SER's Restoration Fellows: Leeji Drifwood and Mickki Garrity

SER's Restoration Fellows Program provides paid opportunities for emerging professionals to contribute to SER programs, gain leadership and authentic professional experience, and build their professional networks across the global restoration community. Restoration Fellows are also encouraged to hone their unique perspectives, express creativity, and add innovation to help SER build a stronger, more inclusive, and more effective organization.

In 2022 [Biohabitats, Inc. entered a three-year partnership](#) with SER to offer an annual part-time fellowship for North American emerging professionals from underrepresented communities to support and grow the next generation of ecological restorationists. We are thrilled to introduce you to Leeji Drifwood, and Mickki Garrity.

As part of their fellowships, Leeji will be working on quantifying the environmental benefits of community restoration projects and Mickki will be inquiring how SER and the global restoration community can elevate and include Indigenous knowledge into the work of ecological restoration.

[Leeji Drifwood](#)

Leeji Drifwood (they/them/theirs) is from the USA and feels most at home in Sarasota, Florida; Chicago, Illinois; and Sheldon, South Carolina. Leeji is currently pursuing a Master of Science in Environmental Science and Policy at Johns Hopkins University, focusing on soil ecology and science. Leeji's initial interest in soil was sparked during a community redevelopment plan for the neighborhood in which they grew up. The neighborhood association worked to address environmental racism in the area, which had two brownfield sites. Exploring mechanisms for bioremediation, led Leeji down the path of curiosity into the dynamic world of soils.

[Mickki Garrity:](#)

Mickki Garrity recently received her Bachelor of Science in Native Environmental Science at Northwest Indian College with the highest honors. A Cobell Scholar, S-STEM Scholar, AMP Scholar, and Doris Duke Conservation Scholar, Mickki wrote about her educational experience as a non-traditional Indigenous student for the Tribal College Journal. This fall, Mickki began graduate studies at the University of Minnesota, pursuing a Master of Science in Tribal Land and Natural Resource Management, and is committed to amplifying Indigenous voices in food sovereignty, ecological restoration, and climate adaptation.



Restoration Fellows: Leeji Drifwood (Top) and Mickki Garrity (Bottom)

SER thanks Biohabitats for their support towards these fellowships.



If you or your organization is interested in supporting SER's Restoration Fellows program, please email sponsorship@ser.org.



SER COMMITTEE UPDATES

Diversity, Equity, and Inclusion (DEI) Committee Update

In February 2022, the SER Diversity, Equity, and Inclusion (DEI) standing committee was formally established following two years of work by the SER DEI ad hoc committee. Over the past year and a half, the committee has made substantial strides in supporting SER's DEI priorities. One significant challenge occurred, however, as several members of the committee had to step down due to unexpected personal and family commitments. The committee undertook is pleased to announce that, after a detailed recruitment process, they onboarded several new members in the third quarter of 2023. Join us in welcoming Shanti Srinivas, Lee Toomey, Swagi Mwita, and Jorge Alvarez, along with SER's own Karen Tekverk as an additional staff representative and Luiz Moraes as the new board representative!

The DEI committee led the SER2023 Open Doors Travel Grant application and selection process. This initiative aims to enhance conference accessibility and inclusivity. The committee created the application, meticulously reviewed all applicants, and provided SER with top-scoring candidates from diverse backgrounds. Special commendation goes to Amarizni Mosyafiani (CERPIT), a dedicated DEI Committee member, for her exemplary leadership in spearheading these efforts and serving as the DEI representative on the SER2023 Conference Committee. Thanks to the work and recommendations of the DEI committee, SER ultimately awarded US\$65,000 in travel grants to 22 conference delegates. The DEI committee gained numerous insights gained from this experience, which they will apply to future Open Doors granting processes. Read more about the program here: <https://ser2023.org/breaking-barriers-in-ecological-restoration-meet-the-inspiring-ser2023-travel-grant-recipients/>.

As 2023 concludes, the committee is expanding its role as a DEI reviewer or SER programs and projects while also offering guidance/sideboards to SER for how to consider whether or not issue public statements on global issues that have significant DEI impacts. The committee will also review SER's corporate ethics guidance to determine whether to recommend to the board the addition of DEI considerations to the guidance. Mid-2024 marks

the conclusion of the first term of the initial committee members, a significant milestone in the committee's journey.

SER is grateful to all of the DEI committee members for their generous contributions to advancing diversity, equity, and inclusion in the restoration space. The committee is also grateful to the broader SER membership for their support and engagement with these issues. If you are dedicated to advancing diversity, equity, and inclusion and wish to actively contribute, consider the possibility of joining the SER DEI Committee in the future. In its first cycle as a formal committee, the SER DEI Committee's journey has been characterized by measurable progress, resolute commitment, and the continuous pursuit of a more diverse, equitable, just, and inclusive restoration community. The committee looks forward to a future where the principles of DEI positively support SER's endeavors and expand into the wider scientific community.

North American Coordinating Committee

The SER 2024 North American Conference Planning Committee is excited to invite you to participate in the first full [SER North American Conference](#), which will be held from 28 October to 1 November 2024 in Vancouver, British Columbia. The conference theme - Cross-Biome Connections: Ecological Restoration on a Diverse Continent - recognizes and explores the opportunities for collaboration across biomes, across boundaries, and across disciplines. The call for proposals (symposia, workshops, and field trips) is currently open. Guidelines for submitting a proposal can be found at <https://sernac.org/call-for-proposals/>. The proposal submission deadline is 15 January 2024. The call for abstracts will open in 2024.

The conference planning committee looks forward to welcoming speakers, exhibitors, and attendees from across North America to share practical and research knowledge and to network and explore new collaborations.

We invite you to consider sponsoring our event or exhibiting goods or services. Exhibitors and sponsors will enjoy a lively atmosphere to increase their company profile and inform ecological restoration professionals about quality services, new and innovative products, and leading-edge technology that can be used to further the science, practice, and policy of restoration. More information on specific benefits for event sponsors and exhibitors is provided [here](#).



SER 2024 NORTH AMERICAN CONFERENCE!

Cross-Biome Connections: Ecological Restoration on a Diverse Continent



October 28 - November 1 2024



Vancouver, BC. Pan Pacific Hotel

Seeking sponsors! Please reach out if you'd like to support the inaugural North American conference. More information about sponsorships available here: <https://sernac.org/become-a-sponsor/>

Stay tuned for updates! Visit <https://sernac.org/> for more information!



CHAPTER UPDATES

SER ASIA NETWORK MAPS OUT ITS LONG TERM VISION AND GOALS AT DARWIN 2023

The SER Asia Network (SER-AN) continues to grow and build membership and is now taking next steps to develop a strategic plan, building on the SER-AN Roadmap developed in 2021-2022. The SER2023 10th World Conference on Ecological Restoration (SER2023) in Darwin provided an important opportunity to bring together interested SER and SER-AN members for a networking lunch and strategic planning workshop to maintain momentum built through the development of the now operational SER-AN Roadmap.

The co-development of the participatory Strategic Plan

SER-AN received a strong boost at the Conference, with active participation in the networking event and the workshop: 'Co-developing visions and pathways within the UN Decade' workshop. A diverse range of members

working across the region from East to West Asia, including China, Indonesia, Mongolia, Laos, India, Saudi Arabia, Hong Kong and Kazakhstan attended. Building on a survey sent out to SER-AN members, the strategic planning workshop, held on Thursday, 28 September, provided an opportunity for attendees to meet and get to know each other, before co-developing a clear set of outcomes to move the network forward utilizing a 'Theory of Change' approach.

Where do we want to be in 10 years

Keeping in mind the UN Decade on Ecosystem Restoration, workshop participants discussed in break-out groups what the vision for our network over the next ten years should be. All discussions were underpinned by our core value: Unity in Diversity. Many great ideas developed, as broad as our membership, and some key themes came through, including:

- Continue to build and grow broad engagement and a strong membership across the region, representing as many Asian countries as possible. Develop a collaborative and supportive community of practice of restoration practitioners and researchers.
- Collaborate and share knowledge and lessons learned – including from failures – across the network through a range of methods: webinars, conferences, sharing research and science outputs through the website and projects database.
- Engage genuinely and share benefits with local and indigenous communities.
- Develop restoration standards, principles and structured tools, and guidance to support planning and decision-making across Asia.
- Increase accessibility and communication through our diverse languages.

Actions we will take

Breaking into groups again, participants discussed achievable actions we can take to achieve our vision. Those that shone through included developing and ensuring an active membership base through engagement and supporting activities such as translation of our work and key SER documents into regional languages; providing trainings, webinars, and workshops to build restoration capacity across the network and region; developing and actively sharing standards and guiding principles to drive best practice restoration; engaging the next generation of restoration advocates, researchers and practitioners; providing knowledge products such as case studies and maps of restoration projects; and providing tools and support for day-to-day actions required to drive restoration – grant funding, and accessible knowledge and research. And of course, our plan towards becoming a fully-fledged SER chapter. Through these discussions, the importance of involving the community at the grassroots level and throughout restoration actions was central.

Who are our key stakeholders, and how can we best influence and collaborate

After our high-level visioning and action discussions, the group talked about who we should aim to work with and who we need to influence, and what is the best way to ensure increased engagement, information sharing, and skills support from the grassroots community level, through to governments and decision-makers. We identified stakeholders, including indigenous groups and local community members, on the ground practitioners and implementers, researchers and academic institutions, non-government and international organizations, and all levels of government.

The workshop concluded with a wrap-up of what we had discussed and achieved and an outline of next steps for the development of the strategic plan. The organizing committee and interested members will collate the input provided so far from the survey and workshop, with the addition of further input at the SER2023 Virtual Conference, to guide a first draft of our strategic plan for consideration and input by members. The process will allow SER-AN to be in the best position to enable real restoration outcomes across the region, including the vast array of ecosystems our members work in. Continuing to break down the language barriers across the region is critical to ensure that the experience we gain can be shared by all.

About the SER Asia Network and how to get involved

The Asia area is SER's most extensive and perhaps the most diverse geographical region. However, it is still behind SER's other regions in terms of membership – we want to see this change! Since SER2021, we have been working hard to develop an online community and network of fellow restoration practitioners and researchers in academia, industry, government and NGO's. The SER Asia Network, or SER-AN, now has over 200 listed interested members, including those from 25 countries across the Asia region. We represent a wide range of countries, languages, cultures and ecosystems and we are learning there is strength and unity in diversity.

We'd love to hear from you! Thoughts or suggestions are most welcome, or let us know if you have a desire to join the teams and get involved.



SER-AN Workshop at SER2023

INTERNATIONAL NETWORK FOR SEED-BASED RESTORATION (INSR) SER2023 UPDATE

INSR had a great turnout at SER's 10th World Conference on Ecological Restoration in Darwin, Australia. INSR put on a two-part symposium on the [International Standards for Native Seeds in Ecological Restoration](#) featuring talks by the authors and other INSR members. All presentations will be available in the Restoration Resource Center as part of the SER2023 video conference library.

The section also hosted our annual membership meeting. INSR Chair Simone Pedrini presented an update on recent and planned INSR activities, including the release of Native Seeds: Supplying Restoration, a nine-part video series on the native seed supply chain in the western United States. The film is available with open access on the [INSR film webpage](#) and our [INSR YouTube page](#). The Board also highlighted our progress on the SER Partnership Grant project that funded translations of the Native Seed Standards into Spanish, French, and standardized Chinese. A German translation will be available soon. Published translations can be found on the [INSR website](#), with more coming in 2024.

Finally, INSR organized a workshop on Seed mix design - theory and practice organized by Eduardo Malta Campos Filho and Marcello DeVitis. Eduardo provided an introduction, and then Paul Gibson-Roy and Mateus Silva each presented a case study from a different ecosystem on techniques and tools for creating seed mixes. These experts then worked with participants in creating seed mixes for potential seeding scenarios. Materials from this workshop are available at bit.ly/INSR_workshop. The workshop saw a turnout of 30 engaged participants.

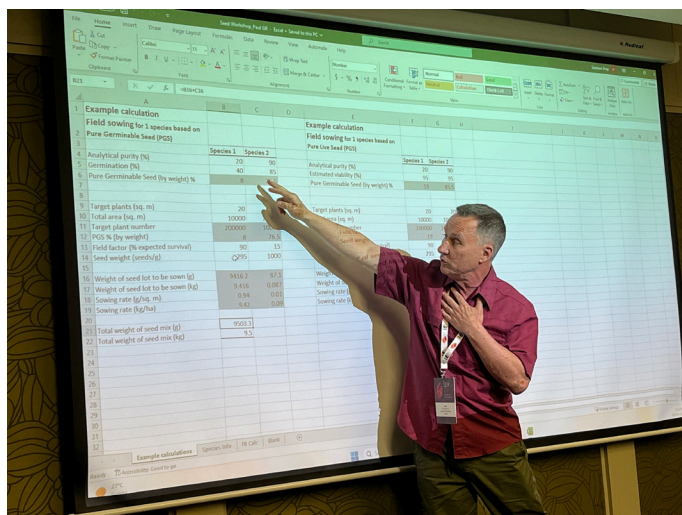
The International Network for Seed-based Restoration (INSR) is the largest global network on Native Seed, with more than 784 members from 68 countries representing research institutions, seed producers, and restoration practitioners.

If you are interested in joining INSR, new members may select INSR as the Primary Chapter/Section of their SER membership or add it as an Additional Chapter/Section via the membership application upon joining the Society. Existing members of SER who are in the middle of their membership year and not yet a member of INSR may join when you renew. In the meantime, contact info@ser-insr.org with your membership number to request provisional membership.

INSR members receive our quarterly e-newsletter with the latest native seed news, events, research, and breakthroughs from all over the world.



INSR Native Seed Standards presenters and colleagues.



Paul Gibson-Roy presenting a case study on developing native seed mixes.

26TH ANNUAL TEXAS CHAPTER OF THE SOCIETY FOR ECOLOGICAL RESTORATION: EMBRACING CROSS-BORDER RESTORATION

The 26th Annual Texas Chapter of the Society for Ecological Restoration Conference took place at the El Paso Convention Center in El Paso, Texas, from 12 to 14 October. This year's conference theme was "Restoration Across Borders," reflecting the unique challenges and opportunities for ecological restoration work in the West Texas region. With 63 attendees from across the state and region, the conference featured a diverse range of activities, including field trips, plenary sessions, a policy panel discussion, poster presentations, a banquet, and an awards ceremony.

Selecting the theme "Restoration Across Borders" was a strategic decision given the conference location in El Paso, a West Texas town that shares its border with Mexico. The success of restoration efforts in this region is intrinsically tied to forging strong working relationships across international borders. The importance of this is heightened by the fact that human-made jurisdictions do not define the ecosystems boundaries in need of protection and restoration. One of the key figures in the ecological restoration field in the El Paso region is keynote speaker Janaé Reneaud Field, who manages The Frontera Land Alliance. This organization oversees management of over 1500 acres of protected land in the City of El Paso. Their efforts have led to the protection of more than 8000 acres, and they play a leading role in the Castner Range National Monument Community Coalition. Through its collaborations with other partners, The Frontera Land Alliance exemplifies the significance of cross-border cooperation. Moreover, the organization has also made strides in the nature education field, ranging from stewardship to art, further emphasizing the multidisciplinary nature of ecological restoration.

A focal point of this year's conference was a panel discussion that explored how to make ecological restoration work effectively across jurisdictional boundaries. The discussion featured representatives from various regions and organizations, each engaged in restoration efforts that transcend borders, and was skillfully moderated by Dr. Kelly Lyons (Trinity University). The panelists included Brandon Belcher from The Nature Conservancy (TNC), Dr. Kevin Thuesen from the Water Quality Protection Laboratory (WQPL), Jason Crosby from the Borderlands Institute, and Jeff Renfrow from Rio Bravo Restoration. The conversation acknowledged that even within the state of Texas, working across jurisdictional boundaries can be



Award Banquet Dinner

challenging but is absolutely essential. The ecosystems we strive to protect and restore do not adhere to the artificial boundaries that delineate our political and administrative jurisdictions. Therefore, fostering collaboration and sharing best practices for cross-jurisdictional restoration is vital for the success of restoration efforts in the region. During the panel discussion, students also inquired about 'imposter syndrome' and how to engage with professionals in the field.

One of the conference's primary goals was to boost membership and engagement in the West Texas and Mexico regions. By organizing the event in El Paso, TXSER aimed to bring attention to the importance of ecological restoration in this area. The conference served as a platform for sharing ideas and knowledge, facilitating cross-border connections, and encouraging individuals and organizations to join the cause. In a significant move, two new board members were recruited from West Texas, a testament to the growing interest and commitment to ecological restoration in this region.

The conference provided a platform for participants to learn from experts and practitioners in the field. With 20 speakers from across the state and 12 poster presentations, a wide range of topics related to ecological restoration were addressed. The conference's program encompassed discussions on critical issues, such as restoration across jurisdictional boundaries, best practices for outreach

and education to raise awareness about restoration, and considerations for restoration under a changing climate. These discussions were not only informative but also inspiring, as they showcased the dedication of ecological restoration practitioners and researchers. Five monetary awards were given to the Best Graduate and Undergraduate Oral and Poster Presentations, along with a new category, Undergraduate Poster for Organizational Capacity.

In recognition of outstanding contributions to the ecological restoration field, two prestigious awards were presented during the conference. The Excellence in Restoration Research award was given to Dr. Javier Ochoa-Espinoza, whose research addresses a range of restoration challenges along the Rio Grande and in the adjacent Mexican state of Coahuila. Dr. Ochoa-Espinoza serves as both a professor at the Universidad Autónoma Agraria Antonio Narro and Deputy Director with the Comisión Nacional de Áreas Naturales Protegidas (CONAP). He works on the strategic planning of conservation and restoration projects in three protected natural areas: Maderas del Carmen, Ocampo, and Río Bravo del Norte, and contributes to sustainable development strategies for rural communities in the region. He works closely with researchers and practitioners on both sides of the international border to ensure his research results are applicable on-the-ground. The Excellence in Restoration Practice award went to Jeff Renfrow of Rio Bravo Restoration, who “has been involved in pretty much every restoration project on the [Rio Grande] river since about 2008” according to a colleague in the region. Mr. Renfrow conducts a large part of the monitoring for restoration projects along the river, by training local Mexican citizens on ecological monitoring techniques. He works extensively with researchers, practitioners, and volunteers from the US and Mexico to help ensure restoration is effective across the international border. The choice of these awardees was particularly meaningful, as both individuals and their respective organizations have demonstrated remarkable collaborative work in the US-Mexico border region.

The 26th Annual Texas Chapter of the Society for Ecological Restoration Conference proved to be an enriching and enlightening event that celebrated and advanced the field of ecological restoration, focusing specifically on the importance of cross-border cooperation. The location of the conference in El Paso, Texas, served as a poignant reminder of the challenges and opportunities inherent in ecological restoration in the border region. As attendees engaged in field trips, discussions, presentations, and

networking, the conference exemplified the spirit of collaboration and knowledge sharing that is central to ecological restoration. The event’s success and its emphasis on the theme of “Restoration Across Borders” underscore the importance of transcending boundaries, both geographic and administrative, in the pursuit of preserving and rehabilitating our natural ecosystems. By working together, ecological restoration practitioners and researchers can make a substantial impact in the West Texas region and beyond.



A Student Luncheon for all undergraduate attendees sponsored by the University of North Texas Advanced Environmental Research Institute and St. Edward’s University



Student-Professional Mixer



Guided Tour of Knapp Land Preserve

SER MID-ATLANTIC CONFERENCE: RESTORING URBAN ECOSYSTEMS

The SER-Mid-Atlantic Chapter's (SER-MA) Board of Directors kicked off the fall season with their annual regional conference. This year's conference was held at the New Jersey Sports and Exposition Authority's (NJSEA) Environmental Center in the New Jersey Meadowlands. The Meadowlands, located a few miles west of New York City, is a unique wetland ecosystem that has historically experienced extensive urban and landfill development, altered hydrology, and pollution. However, due to restoration efforts over the past 40 years, the Meadowlands now serves as a critical ecosystem as an important breeding, foraging, and migratory stopover area for many avian species. It is also home to many fish and shellfish species and Diamondback Terrapins. Restoration practitioners play a key role in these advancements, highlighting the importance of their work. To honor the conference's location, this year's theme was "Restoring Urban Ecosystems." The conference events included one day of presentations followed by a full day of field trip excursions in the Meadowlands and the Northern New Jersey area.



Field trip participants in front of an osprey platform on top of the Erie Landfill.

On the day before the conference, attendees participated in the Meadowlands Birding Festival hosted by NJSEA and the Bergen County Audubon Society. The Meadowlands is a crucial habitat for many migratory bird species, attracting ornithological enthusiasts from all over the world. The Birding Festival event featured several trail walks through the Meadowlands, a bird-banding demonstration, a live raptor show, and a guest speaker presentation by Dr. Jill Deppe of the National Audubon Society.

The first day of the conference consisted of two plenary sessions and a variety of guest speakers. Don Torino of the Bergen County Audubon Society and Paul Juliano, President

of NJSEA, gave a warm welcome to the conference attendees and shared their personal relationships with the Meadowlands. Marty McHugh (Director of Regulatory Affairs for GES), a distinguished guest speaker, spoke on the public trust doctrine. Marty explained the history behind natural resource damage (NRD) claims being allocated to fund ecological restoration projects in New Jersey and across the US. Marty's dedicated work with NRD claims in New Jersey led to the creation of the Office of Natural Resource Restoration for the New Jersey Department of Environmental Protection.



Guest speaker Marty McHugh presenting "The Public Trust Doctrine & Ecological Restoration, 'Perfect Together' in NJ & Across the US."

Later in the day, Danielle McCulloch (USFWS) and Jessie Murray (NOAA) co-presented on the Coastal Habitat and Aquatic Resource Research and Monitoring (CHARRM) workgroup. As a shared resource for restoration practices in coastal and aquatic ecosystems, the workgroup aims to connect resource managers, researchers, and restoration practitioners.

For the first time in the Chapter's history, this year's conference also included a podcast recording in front of a live audience. The "[Native Plants, Healthy Planet](#)" podcast presented by Pinelands Nursery & Supply recorded their "Live From SER!" episode which is available on all platforms. On the podcast, hosts Fran Chismar and Tom Knezick brought on Rebecca Swadek, the Director of Wetlands Management for New York City Parks, as a special guest. On the podcast Rebecca shared expertise on urban wetlands, challenges with keeping New York City's wetlands healthy, and wetland restoration projects occurring in the city. The podcast also included a live interactive segment where members were invited to ask Rebecca questions.

On the second day of the conference, a group of attendees headed out for field trip excursions to three different sites. The day began with a pontoon boat tour of the Hackensack River, where several past, current, and future restoration projects in the Meadowlands were observed along with local wildlife. Next, the field trip participants headed toward the second site, which consisted of a walk through Teaneck Creek Park, featuring the successful 20-acre restoration of emergent and forested wetlands along with exceptional regenerative stormwater conveyance practices. With a backdrop of the New York City skyline, the conference came to a close at the Erie Landfill, where participants observed ongoing grassland restoration efforts on the closed landfill.

To read about the project sites visited and the restoration efforts made for each site, please visit our [conference website](#) or contact our tour guides, Terry Doss (TDoss@njsea.com) and Kevin Dahms (kdahms@biohabitats.com). Thank you to NJSEA, Biohabitats, and Bergen County Parks for providing us with this year's field trip sites and being a beacon of hope for ecological restoration within urban environments.

The Board is looking for additional opportunities to keep the Chapter active in 2024. If you are working on an interesting project or have the ability to host a local opportunity within your state for a field trip and happy hour event, please contact the Chapter's 2024 President, Robert Wachter (WSP USA Inc.) at Robert.wachter@wsp.com.

In continuation with last year's initiatives, the Board is seeking to expand student chapters at universities within the region in 2024. The Board can use any and all assistance in making contact with various universities within the region that have ecology and restoration programs. A chapter board member can provide annual support to university educators interested in starting a student chapter. If you currently know of potential universities within your state that provide such opportunities, please contact Donna Shumpert at DDS@ForeSiteAssociates.com. The Chapter would love to see an increase in student participation at the next conference!

Finally, the Chapter would like to thank board members-at-large, Terry Doss (NJSEA), and Sandy Speers (NJSEA), for their incredible work in planning a successful conference this year. The Chapter is grateful for Drew McQuade, Aleshanee Mooney, Mike Turso, and Henry Pullin of NJSEA for serving as excellent tour guides and for sharing their inspiring work at NJSEA! A huge thanks is also owed to the conference sponsors for making this year's conference possible: Biohabitats, Pinelands Nursery & Supply, Princeton Hydro, and WSP USA Inc. The Chapter would also like to express their gratitude toward Rich Pfungsten (EA Engineering, Science, and Technology, Inc., PBC), the outgoing Chapter President, for his efforts in planning a successful conference and re-invigorating the Chapter following the pandemic years. The Chapter Board elections for executive, state, at-large, and student and emerging professional representatives will be held in November. The Chapter is looking forward to working with all new and returning board members in 2024.

THE RE3 QUEBEC CITY DECLARATION ON ECOSYSTEM RESTORATION

Ecosystem restoration is a key component in achieving a sustainable future for the benefit of nature, including people. The United Nations (UN) Decade on Ecosystem Restoration 2021–2030 (the Decade) aims at increasing efforts to restore degraded ecosystems and halt further biodiversity loss, with the ultimate goal of global ecosystem revival and reversing loss of nature.

The RE3 conference (“From Reclaiming to Restoring and Rewilding”) held last June in Quebec City (see the [SERNews Volume 37 Issue 2, Society News Section](#) for details) was the first national-scale gathering in Canada on ecosystem

restoration since 2004, when the international conference of the Society For Ecological Restoration was hosted in Victoria (Canada). More than 200 experts, specialists, and young future leaders from different cultures and disciplines developed key points and recommendations during the UN Decade Roundtable Session and the Future Leaders Event as important elements that were captured in what is referred to the “RE3 Quebec City Declaration – United Nations Decade on Ecosystem Restoration”. Learn more about it at: <https://chapter.ser.org/easterncanada/2023/10/11/quebec-city-declaration- united-nations-decade-on-ecosystem-restoration/>

